High rates of raised blood lead concentrations in Haitian infants and children

Chris Carpenter, Brittany Potts, Julia von Oettingen, Ric Bonnell, Michele Sainvil, Viviane Lorgeat, Mie Christine Mascary, Xin She, Eddy Jean-Baptiste, Sean Palfrey, Alan Woolf, Judy Palfrey

Published Online
April 8, 2016

Boston Children's Hospital, Boston, MA, USA (C Carpenter MD, B Potts MD, J Von Oettingen MD, M Sainvill BS, X She MD, A Woolf MD, J Palfrey MD); **Dell Children's Medical Center of Central Texas, Austin, TX, USA** (R Bonnell MD); **Kay Mackenson Center, Pierre Payen, Artibonite, Haiti** (V Lorgeat RN, M C Mascary); **Fondation Haïtienne de Diabète et de Maladies Cardio-Vasculaires (FHADIMAC), Port au Prince, Ouest, Haiti** (E Jean-Baptiste MD); **Boston Medical Center, Boston, MA, USA** (S Palfrey MD), **McGill University Health Center, Montreal, Canada** (J Von Oettingen)

Correspondence to:
Chris Carpenter, 6849 Broadway Terrace, Oakland, CA 94611, USA
chriscarpentermd@gmail.com

Abstract

Background Lead exposure is a public-health issue throughout the world. Although many developed countries have implemented screening processes, there has not been a surveillance study of young children in Haiti. This pilot study sought to document baseline lead concentrations in the blood of healthy children living in Haiti and to quantify the prevalence of raised blood lead concentrations.

Methods We did a cross-sectional study of a convenience sample of healthy children aged 9 months to 6 years. Participants were voluntarily enrolled from three geographic departments in Haiti between March, 2015, and June, 2015: children with chronic medical conditions were excluded. We recorded anthropometric data, family income data, and information on lead exposure. We measured lead concentration in fingerprick blood samples at baseline. An elevated concentration of lead in blood was defined in accordance with the US Centers for Disease Control & Prevention (CDC) criterion as ≥5 µg/dL (0·24 µmol/L). We used ANOVA to make comparisons between groups and linear regression to identify predictors of blood lead concentrations.

Findings We enrolled 274 participants: 95 in Artibonite department, 100 in Centre, and 79 in Ouest. Mean age was 3·3 years (SD 1·6 years), median household weekly income was US$30 (IQR $20–50),and 50·6% of participants were girls (n=137); these baseline characteristics did not vary between geographic groups. Children in Centre weighed less and had smaller mid-upper arm circumference than in Ouest and Artibonite. Median concentration of lead was 0·28 µmol/L (IQR 0·21–0·37), and was significantly higher in Centre (0·33 µmol/L [0·27–0·41]) than Ouest (0·25 µmol/L [0·20–0·33]) and Artibonite (0·25 µmol/L [0·20–0·33]; p=0·04). We recorded raised concentrations of lead in 174 (58·2%) participants. Frequency of concentrations of lead ≥0·24 µmol/L was greater in Centre (82%) than in Ouest (50·6%) and Artibonite (54·7%) (p<0·0001). Frequency of concentrations ≥0·48 µmol/L (n=26, 8·7%) or ≥0·97 µmol/L (n=3, 1%) did not differ between departments. Exposure to discarded batteries (but not to motorised vehicles, paved road, lead-based gasoline, or lead-based paint) was a significant predictor of higher lead concentrations, although parental knowledge about the possibility of exposures was low.

Interpretation Haitian children have unacceptable rates of raised blood lead concentrations, with an unexplained disproportionate elevation in children living in the Centre department. Our findings suggest that routine, widespread screening, detailed investigation into modifiable risk factors, targeted public health intervention, and prevention strategies should be strongly recommended.

Funding Kay Mackenson Center, which receives support from the Goldsmith Foundation. In-kind donation by Magellan Diagnostics Inc (Billerica, MA, USA;LeadCare2 equipment and supplies for blood lead level testing).

Declaration of interests
We declare no competing interests.